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SOCIETY PROCEEDINGS

THE HELMINTHOLOGICAL SOCIETY OF WASHINGTON

The forty-fifth meeting of the society was held September 17, 1920.

Dr. Stiles presented an informal report on the prevalence of entamebae in man in the United States, noting that infection with amebae was probably more prevalent than was generally believed and citing Kofoid's work in this connection.

Dr. Yoshida presented an abstract of a paper by Dr. Y. Saheki, on experiments resulting in the successful development of *Hymenolepis nana* in man, rats and mice by feeding eggs from the tapeworms of this species from man.

Mr. Wigdor presented a note on an unusual and a new species of *Diphyllobothrium* in an imported dog, in which he reported the collection of *D. fuscum* and of a new species of *Diphyllobothrium* from an imported Russian sheep dog. The new species resembles most closely *D. cordatum*.

Dr. Schwartz presented a new record of *Hymenolepis diminuta* from man in the United States. The record is based on a number of gravid segments collected from the stool of a child 2½ years old by the child's mother and sent to the laboratory by Dr. C. C. DuBois of Warsaw, Indiana, with the statement that the child had passed several feet of tapeworm on a previous occasion. Dr. Schwartz noted five published records of this parasite from man in the United States, reported by Weinland (1858), Leidy (1884), Packard (1900), Deaderick (1907), and Nickerson (1911). In discussion, Dr. Stiles reported three unpublished cases, making a total of nine cases, of this worm in man in the United States. Dr. Cort reported that Dr. Malloy had found a case of the same sort in Nicaragua.

Mr. Chapin reported the finding of *Hymenolepis farciminosa* in the starling, *Sturnus vulgaris*, in this country, indicating that this tapeworm parasite of the bird in Europe has been successfully established in this country.

Dr. Cobb reported that *Anguillula silesiae*, the eelworm occurring in the mats on which the Germans placed their beer steins, had now been found by him in rotten peaches. Apparently it feeds on an organism found in decaying peaches and probably on the same organism in beer mats. It apparently finds favorable conditions in a medium containing a certain content of acetic ether.

Dr. Hall presented a note regarding *Cuterebra* larvae from cats, with a list of those reported from other hosts. Two new cases from cats were presented, one being a case from Washington, D. C., where the larva was present in the neck, and one being a case from Nashville, Tenn., where the larva was collected from the nostrils. What appear to be similar cases of *Cuterebra* in the cat have been reported in at least eight instances previously. The paper included a summary of published and some unpublished cases of larval *Cuterebra* (including *Bogeria* and *Rogenhoferia*, subsequently separated from *Cuterebra*) from various hosts, and a key to the genera *Cuterebra*, *Bogeria* and *Rogenhoferia*.

Dr. Hegner gave an informal talk on European parasitologists and the conditions of their laboratories since the war, having just returned from a trip in which he attended the unveiling of the monument to Eduard van Beneden, who was, among other things, a parasitologist.

Dr. Cort presented a note on sex in the Schistosomes (since published in *Science*, 53: 226-228).

The forty-sixth meeting of the society was held October 23, 1920. Dr. Hassall was elected president and Dr. Hall secretary.

Dr. Cort called attention to a species of fluke described from man in Japan by Onji and Nishio in 1915. This work was done in Miyairi's laboratory, but has apparently never been noted in the literature outside of Japan or in

any language except Japanese. The fluke, *Heterophyes nocens*, occurs in the southwestern part of the largest of the Japanese islands and was first found by Onji, a practicing physician. It is only known from two villages and occurs in 22 to 30 per cent. of their inhabitants. The final larval stage occurs in a fish, *Mugil japonicus*, which is customarily eaten raw. The life history has been experimentally demonstrated by feeding infested fish to dogs. In the primary host, the fluke occurs free in the intestine or attached to the intestinal villi. It is very similar to *Heterophyes heterophyes*, but is smaller. *H. nocens* is 0.9 to 1.1 mm. long. The rodlets of the genital sucker are about sixty in number, instead of seventy to eighty as in *H. heterophyes*. The intestinal ceca are unequal in length and extent. The encysted larva is one-third as long as the adult. When these larvae are fed to dogs, they become mature and egg production begins in seven to eight days.

Dr. Cort also noted that the eggs of *Metagonimus yokogawai* were long confused with those of the more dangerous *Clonorchis sinensis* and that the latter worm is not as common as was once thought. The eggs of *Clonorchis* are often shouldered at the operculum, whereas those of *Metagonimus* and *Heterophyes* are not shouldered, but have a smooth oval outline.

Dr. Bartsch called attention to the fact that the parasitologists had not been represented at the Pan-Pacific Congress, though the nature of the Congress was such that they should have been represented. He also noted the receipt from Dr. Yoshida of specimens of the snail which is the intermediate host of *Schistosoma japonicum* from Dr. Yoshida; the correct name of the snail is *Blanfordia japonica* (Adams, 1861).

Dr. Bartsch reported that a number of Japanese molluscs had been introduced into California and established there, and commented on the danger of such introduction, noting that *Paragonimus* had successfully established itself in Peru. This danger was emphasized in the discussion by Dr. Cort, and Dr. Stiles noted the occurrence of a doubtful case of schistosomiasis in the southern United States.

Dr. Boeck reported the examination of 157 individuals for amebae. A 1 per cent. aqueous solution of eosin was found to stain everything in a smear preparation of feces except protozoa and certain fungous cysts. An ordinary smear requires a half hour to examine thoroughly for protozoa, whereas with suitable technique it is expected to cut this time to ten to twelve minutes. At least two preparations are examined before a negative report is made. The iodine stain is used to differentiate species of amebae, and, if necessary, iron hematoxylin is used. Permanent preparations are made and filed. The examinations are complicated by the occurrence of flagellates. So far only two cases of *E. histolytica* have been found, with over twenty cases of *E. coli*, and about ten cases of *Giardia*. There were a total of fifty-seven cases of protozoan infections, eight cases where two species of parasites were present, and three cases where three species of protozoa were present, one of these cases being complicated by hookworm infestation. Dr. Ransom reported that he had once been infected with *Chilomastix*, the infection terminating of itself without treatment.

Dr. Ransom presented a note by Dr. Raffensperger on ascariasis in swine. Of ninety-three pigs farrowed from ten sows on a farm in Illinois, late in September, only 55 were left alive in October. Two of these were killed and examined postmortem, numerous ascarid larvae being found in the lungs. Seven larvae were found on one slide in a bit of mucus from the air passages, and twenty-two young worms were found in a small amount of the duodenal contents of one of the pigs. The pigs showed symptoms of "thumps." The previous year worm-infested pigs had been kept several months in a small orchard, where they had also passed numerous ascarids after anthelmintic treatment. This orchard, which had thus become badly contaminated, was used as a pasture for the sows and new-born pigs above mentioned. The findings in this case and similar cases speak for the abolition of the permanent hog lot so far, at least,

as young pigs are concerned. Clean pens, clean udders in the case of sows at the time of farrowing, and clean or only slightly contaminated pasture can be secured under farm conditions and will prevent serious infestation.

Dr. Ransom also reported the guinea-pig for the first time as a host of *Hymenolepis nana*, or *H. n. fraterna* if one regards the form from rats as a variation of the form in man. A guinea-pig had been kept with rats and became infested, presumably from the rats. It had about a dozen of these tapeworms, all immature, the largest being 3 mm. long and having fifty to sixty segments. The primordia of the genitalia were present.

Mr. A. H. Clark discussed the questions of parasitism, commensalism, etc. among marine animals.

Dr. Hegner presented a note in regard to bodies found in the red blood cells of the bull frog and the green frog on Long Island, New York (published in this number of the JOURNAL).

Dr. Stiles reported more fully on his three unpublished cases of *Hymenolepis diminuta* from man, briefly mentioned at the previous meeting of the society. In one case the specimens were collected by Dr. Talcott at Greenwood, Neb., in 1906; in another by Dr. Constance at Washington, D. C., in 1911, and in another by Dr. Leonard at Gastonia, N. C., in 1912.

Dr. Stiles also presented the following note:

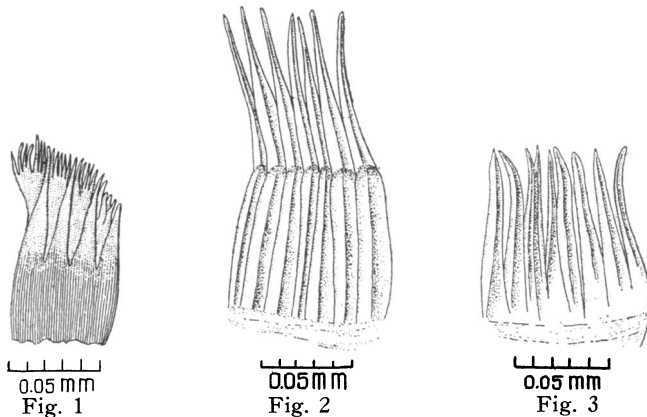
Ascaris lumbricoides caught in the eye of a shoe-button. (Published in *J. Am. M. Assn.*, 76: 239.)

The forty-seventh meeting of the society was held at Baltimore, Md., November 20, 1920.

Miss Cram presented the following note:

A CASE OF NANISM IN *STRONGYLUS VULGARIS* AND OBSERVATIONS ON THE LEAF CROWNS IN SPECIES OF *STRONGYLUS*

An abnormal specimen of *Strongylus vulgaris* was collected by Dr. Hall from a horse at Bethesda, Md. The specimen is a male of the same width as the normal males of this species, but is only about half as long, being 8 mm. long instead of 15 or 16 mm. In all other respects it appears normal.



When mounted the head was bent in such a way as to give a view of the anterior extremity as seen from the front and side, and it was noted that the outer elements of the leaf crown were not the simple structure ordinarily observed in strongyles possessing leaf crowns, but were split up into smaller elements (Fig. 1). On dissecting several normal specimens of *Str. vulgaris*, it was discovered that each of the initial basal elements was fringed out in the distal portion to form several finer tips, some elements showing as many as eight of these divisions. The elements of the leaf crowns of *Str. equinus* and

Str. edentatus, on the other hand, when similarly dissected, proved to be the usual simple, one-pointed structures. Those of *Str. edentatus* (Fig. 2) are slightly more complex than those of *Str. equinus* (Fig. 3), as the former have a thick ridge at about half the length of the leaves from the base, the distal portion bending forward and in toward the longitudinal axis of the worm, a feature which is not present in the quite simple leaf elements of *Str. equinus*. These variations from the extremely simple leaf elements of *Str. equinus* through the slightly more complex elements of *Str. edentatus* to the elaborate elements in *Str. vulgaris* do not seem to have been previously noted.

Dr. W. G. MacCallum presented the following note:

CHEMOTHERAPY IN INFESTATIONS WITH *DIROFILARIA IMMITIS*

Dogs imported into the Fiji Islands commonly die in the course of eighteen months as a result of the plugging of the pulmonary artery with *Dirofilaria immitis*. The writer undertook to investigate the effect of a number of drugs on the larvae in the blood by tests *in vitro* under the microscope. Most drugs were found to be ineffective in a dilution compatible with their administration by intravenous injection. Quinine was lethal to the parasites in dilutions of 1:5,000 and emetin in dilutions of 1:7,000. On intravenous injection in these dilutions, quinine killed the dogs before it killed the worms, but emetin was tolerated. The efficacy of the emetin treatment was not ascertained.

In the discussion Dr. Ransom noted Rogers' use of tartar emetic (the sodium salt) for filarial infestations, and Dr. Hall noted Schultz' use of collargol for filariae. It was also noted that the record of *D. immitis* from man is an error due to mislabeling. Dr. Grant reported that he had given tartar emetic in doses of 1 to 2 grains in 1 per cent. solutions without obtaining conclusive results.

Dr. Hegner reported the finding of a new blood parasite in the frog. The parasite is a protozoan which occurs free in the blood stream. It has the form of a disk with an undulating membrane originating on the concavity of the disk. The same frogs contain trypanosomes and Lankesterella in the blood, raising the question as to whether the new form is a stage in the life history of one of these forms.

Dr. Ransom presented a note by Drs. Ransom and Raffensperger on the development of *Arduenna strongylina* in the guinea-pig. Last summer Dr. Ransom examined specimens of *Onthophagus hecate* and other species of coprophagous beetles collected in hog pens near Bloomington, Ill., and found them commonly infested with larval nematodes, 1 to 2 mm. long, encapsuled in the body cavity. These larvae correspond to forms recorded by Seurat (1916) as occurring in coprophagous beetles in Algeria and identified by him as the larvae of *Physocephalus sexalatus* and *Arduenna strongylina*, the adults of which are common parasites in the stomach of the hog. The larvae of the two species as described by Seurat are very similar but may be distinguished from one another by the different location of the nerve ring and the presence or absence of spines on the tip of the tail. Recently Dr. Raffensperger at Chicago fed ten larval nematodes isolated from coprophagous beetles collected in a hog pen to a guinea-pig. Eleven days later he killed the guinea-pig and recovered from the contents of the pyloric portion of the stomach a small nematode which he suspected was an *Arduenna strongylina*. The specimen has been examined by Dr. Ransom and found to be a male of the species in question in the last larval stage preceding the adult stage, indications of an ecdysis about to occur being evident. It measured 5.8 mm. in length with a diameter of 160 μ in the middle of the body. The full grown adult male commonly measures 10 to 15 mm. in length and 300 μ or more in maximum diameter. Accordingly the young worm from the guinea-pig, had it been permitted to continue its development, besides undergoing an ecdysis which was impending, would have had to grow considerably before attaining the full size of the adult as it is commonly

found in hogs. During a period of 11 days in the guinea-pig it had grown to about three times the size of the larva as it is found encapsuled in beetles, and had undergone probably one molt, meanwhile developing from the third to the fourth or last larval stage and reaching a point in its development at which it was nearly ready to transform into the adult stage. Including the present case the nematodes recorded as occurring in the guinea-pig are *Trichinella spiralis*, *Gongylonema neoplasticum*, *Ascaris lumbricoides* and *A. suum* (larval stages), *Arduenna strongylina* (last larval stage), all from artificial infections with which may also be included various species of hookworms and Strongyloides whose larvae will live temporarily in this host, and finally *Paraspidodera uncinata* (natural infestation). The last named species was originally recorded by Travassos (1914) from the large intestine of the guinea-pig and related rodents in South America. It has been found by Ransom in guinea-pigs reared at Bethesda, Md., but apparently has not heretofore been reported in the United States.

Dr. Ransom also presented a note on some unusual parasites of the domestic hog. Three specimens of hookworms collected by Dr. S. Hadwen from the stomach of a pig at the Central Experimental Farm, Ottawa, Canada, September 4, 1919, were forwarded to the U. S. Bureau of Animal Industry for determination. These specimens, all females, two of which were immature, have been found to be *Uncinaria stenocephala* Railliet or *U. polaris* Looss. *U. stenocephala* occurs in dogs in Europe and *U. polaris* in foxes in North America. The two species are probably identical. In the Bureau of Animal Industry collections are some specimens of the common hookworm of sheep, *Bunostomum trigonocephalum*, labeled as collected from the pig by Dr. Cooper Curtice in May, 1890. In the same collections are also specimens of nematodes somewhat resembling hookworms collected from the small intestine of pigs by Dr. F. L. Kilborn at Washington, D. C., in May, 1890, and by Ransom at Bethesda, Md., in October, 1906. These belong to the species *Crassissoma urosubulatum* described by Alessandrini in 1909 from the pig in Italy. So far as known it has not heretofore been reported in the United States.

Dr. Schwartz presented a note on the Effect of Secretions of Certain Parasitic Nematodes on Coagulation of Blood. (Published in the JOURNAL, 7: 144.)

Dr. Root presented the following note:

A CASE OF INTRA-UTERINE PUPATION IN THE SHEEP TICK

The sheep tick, contrary to the usual condition among insects, is pupiparous, and the egg is not deposited as such, but is carried in the body until it forms a puparium. In a number of specimens recently examined, one tick was found dead and on dissection was found to have in the uterus a puparium containing a fully mature young tick. In this case the death of the mother tick did not stop the development of the young tick, contrary to what is true of such flies as the tse-tse.

Dr. Simon presented the following note:

GIARDIA IN FIELD MICE IN NOVA SCOTIA

Of the field mice in Nova Scotia, 85 per cent. are affected with *Giardia*, apparently *G. microti* of Kofoid. The finding is of interest in connection with the question as to whether man becomes infested with *Giardia* from rodents. Grassi thought this was the case, believing that infection occurred through the feces. But rodents have been found to harbor several species of *Giardia*. *G. microti* closely resembles the human form. Attempts by the writer to infect wild rats with the human species have failed, though these rats could be infected with *G. muris* and the infection carried successively through white rats to white mice and vice versa. An experiment is now under way to determine whether the species from field mice in Nova Scotia can be transmitted to wild rats by feeding.

Dr. Boeck noted the presence of *Giardia microti* in *Peromyscus gambelli*.
Dr. Boeck also presented the following note:

A PROTOZOAN SURVEY OF AN INDUSTRIAL SCHOOL FOR BOYS AND GIRLS

Total number of cases examined.....	83	
Total number of examinations.....	444	
Average number of examinations per case.....	5.3	
Total number of positive examinations.....	250	
Total number of negative examinations.....	194	
Total number of positive cases.....	66	79.5%
Total number of negative cases.....	17	20.4%
Number of persons infected with protozoa.....	64	77.1%
Number of persons infected only with protozoa.....	55	66.2%
Number of persons infected with worms.....	11	13.2%
Number of persons infected only with worms.....	2	2.4%
Number of persons infected with protozoa and worms.....	9	10.8%
Number of cases of:		
<i>E. histolytica</i>	9	10.8%
<i>E. coli</i>	41	49.3%
<i>Endolimax nana</i>	5	6.0%
<i>Iodamoeba bütschlii</i>	1	1.2%
<i>Giardia intestinalis</i>	40	48.1%
<i>Chilomastix mesnili</i>	1	1.2%
<i>Hymenolepis nana</i>	4	4.8%
Hookworm	2	2.4%
<i>Ascaris</i>	4	4.8%
<i>Oxyuris</i>	1	1.2%
<i>Trichuris</i>	2	2.4%
Cases with a single infection of protozoa.....	37	44.5%
Cases with a double infection of protozoa.....	22	26.5%
Cases		
<i>E. coli</i> and <i>Endol. nana</i>	2	
<i>E. coli</i> and <i>E. histolytica</i>	3	
<i>E. coli</i> and <i>Giardia</i>	14	
<i>E. coli</i> and <i>Chilomastix</i>	1	
<i>E. histolytica</i> and <i>Giardia</i>	1	
<i>Giardia</i> and <i>Endol. nana</i>	1	
Cases with triple infection of protozoa.....	4	
<i>E. histolytica</i> and <i>giardia</i>	2	
<i>E. coli</i> , <i>E. nana</i> and <i>Giardia</i>	2	
Quadruple protozoan infection.....	1	
<i>E. histolytica</i> , <i>E. coli</i> , <i>Ioda.</i> , <i>Giardia</i>	1	
Single worm infections	10	
Triple worm infections.....	1	

In the discussion of Dr. Boeck's paper, Dr. Simon noted the theory that infection with these parasites was most apt to occur in the "crawling stage" of childhood, with its accompanying difficulty in the matter of proper sanitation. In this connection he noted that field mice could be infected with *Giardia* in the absence of water. Dr. Welch called attention to the fact that variations in the degree of protozoan and worm infestation reported by various observers was due in part to differences in skill and technique on the part of these observers. Dr. Boeck noted that these variations were due in part also to variation in the distribution of the parasites in the feces.

Dr. Hall presented a note proposing new generic names for the species *Strongylus rubidus* Hassall and Stiles and for *Filaria osleri* Cobbold. He also noted the presence in *St. rubidus* and in *Ornithostrongylus quadriradiatus* (Stevenson) of peculiar accessory structures, which were described by the authors of these species. He found that these structures stain well with gentian violet and as they are very transparent he suggested that other nematodes be examined by means of this stain, as it appears that the structures are much commoner than is indicated by the lack of records regarding them. These structures serve to support the cloacal aperture, the terminal portion of the cloaca, and the genital cone. He proposed the name *telamon* for such a structure. Gentian violet is a very amenable stain which seems well adapted to the study of this structure and of the bursal rays and some other nematode structures.

Dr. Cort presented a note on Prenatal Infestation with Parasitic Worms (Published in the *J. Am. M. Assn.*, 76: 170-171.)

Dr. W. H. Welch made some interesting remarks, calling attention especially to a new synthetic arsenical, tryparsamide, which had been found very

effective against *Tr. gambiense*, although apparently of little value against *Tr. rhodesiense*. In using it on African natives, it was found that the natives raised no objection to intravenous injection, but objected to intramuscular injections.

The forty-eighth meeting of the society was held December 10, 1920.

The following were proposed for active membership: D. L. Augustine, Elery R. Becker and Charles E. Simon, by Dr. Cort; W. G. MacCallum, by Dr. Ransom; and were duly elected.

Dr. Hall presented a note in regard to carbon tetrachloride as an anthelmintic for use in removing hookworms. Tests of this drug on thirty dogs showed that in comparison with similar tests of other substances used to remove hookworms, carbon tetrachloride was much more effective, removing all of the worms with considerable certainty when administered in capsules in doses of 0.3 mil per kilo of weight of dog without purgation. It was given with safety in doses of 1.5 mils per kilo, without the production of evident toxic symptoms or postmortem lesions macroscopically visible. It also removed ascarids, being but slightly less effective than chenopodium for this purpose. Carbon tetrachloride is cheaper than other drugs now in use for removing hookworms. A chemically pure product must be used.

In comment, Dr. Stiles noted that chenopodium and thymol are the only drugs extensively used at the present time. Caius and Mhaskar have recently stated that there are no records of deaths from thymol; Dr. Stiles reported that he knew of about sixteen deaths from this drug. Chenopodium has a death list of about 70, according to a recent writer; Dr. Stiles noted that three deaths had occurred in one day in Kentucky from this drug. Chenopodium is not uniform in its composition, a fact which adds to the danger of using it. The cost of treatment is an important factor in large-scale hookworm campaigns. With any anthelmintic the field worker must run some risk, the risk in his case being greater than that in private practice or in hospital work, but the risk is offset by the actual and potential benefit. Carbon tetrachloride, if found satisfactory in human medicine, would have the advantage of being cheap of itself and saving the cost of purgation.

In further comment, Dr. Cort noted that there had been some rioting in Ceylon, following deaths from chenopodium poisoning.

Dr. Stiles presented the following charts covering effects of temperature on hookworm eggs and larvae and on fly eggs and larvae:

Condensed Hookworm Thermometer

- 8 to 10° C. (46.4 to 50° F.): This is the lowest demonstrated temperature at which hookworm eggs, placed under favorable conditions, will segment and will hatch out larvae that reach the infecting stage.
- 8 to 18° C. (46.4 to 64.4° F.): In this range of temperature, hookworm larvae are sluggish to motionless.
- 20 to 35° C. (68 to 95° F.): Favorable to hookworm development and motility.
- 25 to 30° C. (77 to 86° F.): Optimum for development of hookworm eggs and larvae and for motility of larvae.
- 35 to 40° C. (95 to 104° F.): Less favorable to hookworm development and motility.
- 40 to 50° C. (104 to 122° F.): Eggs have been observed to hatch at 40° C., but in general constant temperatures above 37° C. are reported as unfavorable to fatal for eggs and larvae. However, both eggs and larvae can stand 40 to 50° C. for a few minutes and survive.
- 50 to 60° C. (122 to 140° F.): Fatal to eggs and larvae in 1 to 5 minutes.
- Above 60° C. (above 140° F.): Fatal to eggs and larvae almost instantly.

The data for a house-fly thermometer do not seem to be so extensive as in the case of hookworms, but the following points quoted by Howard (1911), are of distinctly practical importance.

Condensed House-Fly Thermometer

- 7.2° C. (45° F.): Eggs of *Musca domestica* did not develop until brought into a warmer temperature.
12.2° C. (54° F.): Larvae had not matured at end of 8 weeks.
15.6° C. (60° F.): Eggs have been hatched in 12 hours.
18.3 to 23.9° C. (65 to 75° F.): Duration of life round was 3 weeks.
23.9 to 26.7° C. (75 to 80° F.): Eggs have been hatched in 8 to 12 hours.
32.2 to 36.7° C. (90 to 98° F.): Larvae mature in shortest period in fermenting materials.
37.8 to 43.3° C. (100 to 110° F.): Larvae leave the hotter portion of manure.

These charts indicate the temperatures under which sanitation is most urgent and those under which sanitation becomes a matter of less importance and urgency. Above and below the favorable temperatures, compromise measures in sanitation become possible. If feces can be pasteurized, hookworms may be killed in this manner. Diet is an important factor in this connection. Where much meat is eaten, as in northern climates and in city workers, the feces offer less favorable conditions for hookworm development than where little meat is eaten, as in southern climates and in rural districts.

In an additional note, Dr. Stiles stated that ground water pollution must be regarded as a standard in sanitation. This is true as regards the storage and disposal of excreta. Dr. Cox in Virginia has found coal gas tar and kerosene of value in preventing fly breeding. Working independently, Dr. Stiles, at a later date, tested coal gas tar and found its use a very cheap and effective control measure for flies. The tar costs 5 to 20 cents a gallon, depending on whether it is purchased in car load lots or by the gallon. Added to feces it does away with the necessity for screening against flies. Since dark privies attract anopheline mosquitoes, malaria carriers, light privies may be used with the tar without attracting flies, as light privies do. The mixture of tar and excreta may be ultimately dumped and covered with sawdust, without subsequent fly breeding. A gallon of coal tar to a cubic yard of soil does not appear to inhibit the growth of vegetation.

In comment, Dr. Hall noted that empty tar barrels standing in the hot sun must be regarded as possibly dangerous, as a newspaper has published one instance in which throwing a lighted match in an empty barrel of this sort caused an explosion with the death of one person resulting.

Dr. Cort reported that the Department of Medical Zoology, School of Hygiene and Public Health, Johns Hopkins University, would undertake investigations in Trinidad under the auspices of the Rockefeller Foundation in regard to hookworm larvae in soil and the factors of importance in this connection. This work will be carried on in the summer of 1921 in collaboration with Dr. Payne of Trinidad, the party from the United States to consist of Drs. Cort and Ackert and Mr. Augustine.

Mr. Chapin reported the occurrence of *Dipylidium sexcoronatum* in the cat, the specimen being collected at New Haven, Connecticut.

Dr. Schwartz presented the following note:

SUMMARY OF LITERATURE ON EFFECTS OF EXTRACTS OF PARASITES ON
PATHOGENIC BACTERIA

André (1878) reports that *Taenia* infestation in cases of pulmonary tuberculosis in man has a beneficial effect on the patient by retarding the course of the disease. Granger (1897) corroborated this view on the basis of his clinical findings.

Picou and Ramond (1889) found that extracts of *Taenia* inhibit the growth of various pathogenic microorganisms in vitro. These writers also state that injections of *Taenia* extracts into guinea-pigs rendered them more or less refractory to infections with the cholera organism, since nine out of ten guinea-pigs thus treated survived. Jammes and Mandoul (1904) failed to find bactericidal properties in *Ascaris* fluid. They also found that many pathogenic

bacteria were unaffected by extracts of *Taenia pisiformis*. They found, however, that extracts of *Moniezia expansa* retard the development of certain pathogenic bacteria *in vitro*. Jammes and Mandoul also state that injections of extracts of *Taenia* and tubercle bacilli give rise to a slower development of tuberculosis with resultant milder lesions than the injection of tubercle bacilli without *Taenia* extract.

Joyeux (1906) found that in a general way extracts of nematodes are not bactericidal but that extracts of cestodes possess bactericidal properties.

Perroncito (1912) failed to confirm the results of previous investigators concerning the retarding influence of *Taenia* extracts on the development of tuberculosis in guinea-pigs. He found that guinea-pigs injected with *Bacillus tuberculosis* developed as intense lesions as guinea-pigs injected with tubercle bacilli alone. Perroncito found, however, that dysentery bacilli (Flexner and Shiga) do not develop in *Ascaris* fluid. Like wise, he found that extracts of species of Anoplocephala from the horse are bactericidal to dysentery organisms (Shiga type).

Alessandrini (1912) found that extracts of several species of cestodes and nematodes retard the development of certain pathogenic bacteria *in vitro*. Anthrax organisms showed the greatest susceptibility to these extracts. Alessandrini also found that the administration of *Ascaris* fluid and *Bacillus pyocyaneus* into dogs *per os* brought about the disappearance of the bacteria since they could not be recovered in the feces. Control dogs fed *Bacillus pyocyaneus* showed the organisms in the feces. He obtained similar results in dogs harboring *Taenia pisiformis*, showing that this parasite is detrimental to *Bacillus pyocyaneus*. This writer found moreover, that chickens harboring *Heterakis papillosa* were practically immune to fowl cholera.

Perard (1912) examined post mortem 300 tubercular cattle and 300 non-tubercular cattle with a view of determining the incidence of tapeworm infection complicated by tuberculosis. He reached the following conclusions:

1. Tuberculosis is found in the same frequency in cattle infested with tapeworm as in cattle free from tapeworms.
2. Tubercular lesions are frequently found in the neighborhood of tapeworm lesions.
3. There are as many advanced cases of tuberculosis and tapeworm infestation in cattle as there are cases of incipient tuberculosis and tapeworms.

Despite the contradictory evidence, it must be admitted that the published data warrant the belief that certain parasitic worms contain bactericidal substances. The bactericidal substances are specific for certain microorganisms and do not appear to influence the growth and development of other organisms.

The writer found that physiological salt solution extracts of *Ascaris lumbricoides* inhibit to a considerable extent the growth of *Bacillus pyocyaneus* *in vivo* and *in vitro*. One series of experiments on guinea-pigs yielded the following results:

Two guinea-pigs injected subcutaneously with *Ascaris* extract and *Bacillus pyocyaneus* showed a small localized, non-suppurating abscess at the site of injection. The animals survived. Two control guinea-pigs injected with material from the same culture, without the extract, developed large abscesses which extended over the entire abdomen and which resulted in death of the animals after several weeks.

In connection with the bactericidal properties of parasitic worms, it may be noted that shortly after the rise of bacteriology as a medical science, parasitology lost considerable prestige among medical men. Prior to the discovery that many diseases of man, well known clinically, were caused by specific bacteria, worms were considered by many medical "authorities" as causative agents of various diseases. Relegated from its one time important position, parasitology became a neglected field of medicine. As a matter of fact worms came to be regarded by some writers as beneficial to the host and were said to be "the guardian angels of children." Guiart (1914) considers the views of

Alessandrini (1912) with reference to the bactericidal properties of parasitic worms as an echo of the view of the alleged beneficial rôle of parasites in the economy of the host.

In comment, Dr. Stiles noted that the removal of hookworms from patients suffering from tuberculosis led to improvement in the tuberculosis, and that in some parts of Kentucky the incidence of hookworm disease was said to coincide in general with the greatest incidence of tuberculosis.

Dr. Bartsch exhibited a turbellarian worm (*Leptoplana* sp.) parasitic on oysters and doing considerable damage to oyster beds in the Gulf of Mexico.

Dr. Cobb presented notes as follows:

A serious disease of the cocoanut palm, due to nematodes, has from time to time appeared in the West Indies and, in certain parts, wiped out the industry. It has now appeared in Panama. The cocoanut palm is a very important plant, its oil content being of such value that it would be a very important competitor with butter, except for its lack of vitamins.

A nematode was reported from the hot springs in the Yellowstone Park, the worm living at a temperature of 53° C.

Results of further study of rhabditin, a substance in nematodes which was previously discussed before the society, were reported. Of eighty nematode genera examined, forty-four showed no birefringent granules, though very small ones might have been overlooked. These granules present in the other thirty-six genera have been named by adding the suffix *in* to the generic name. Sometimes there are six or seven types in one organism, usually in the intestine. They are divided into two classes, one anabolic and one katabolic or excretory, and these classes are indicated by the prefix *ana* and *kata*, thus, anarhabditin and katarhabditin. In the case of such nematode genera as end in *us*, this is dropped, thus, anoncholaimin. Little is known about these substances in parasites. Anarhabditin is of interest, since this substance is used up in reproduction, the granules nearest the genitalia disappearing first. Plasts or shells of the rhabditin are left behind in the cells. The anabolic granules are usually spheroidal or ellipsoidal, while the katabolic granules are sometimes true crystals.

The forty-ninth meeting of the society was held January 29, 1921.

Dr. Cobb presented a note on nematodes collected by the Canadian Arctic Expedition under Stefansson. He has in his possession now nematodes from the North and South Polar region, including land and fresh water forms. The free-living nema collection of the Canadian Expedition is a large one, totaling 7,404 specimens, all of which have been examined. These were mounted on slides and charted under low magnification ($\times 5$) by means of camera lucida, the chart showing the specimen number and identification, each specimen being distinguished by a record of position, form and size. Of the specimens, 70 per cent. were species of *Plectus*, and of these 50 per cent. belonged to two species. Many specimens showed evidence of a microzoan disease, and the same is true of Antarctic *Plecti*. There are a total of twenty-two genera and forty-seven species represented. About 50 per cent. of the species are common much farther south, many occurring in the vicinity of Washington, D. C., and in the tropics, and such species must be regarded as truly cosmopolitan.

This material afforded an opportunity to make a study in measurements. Fully mature, perfect specimens, perfectly preserved and exactly in profile, when carefully measured showed as much as a 50 per cent. variation in actual length while the ratios utilized in nematode formulas were quite definite and constant.

In the discussion, Dr. Bartsch noted the probable importance of wild fowl as carriers of free living nemas, reporting that molluscs showing certain aberrations occasionally appeared in various localities and then died out, probably having been carried in on the feet of wild fowl, developing in the new and

unsuitable environment in an abnormal manner, and then dying out. In newly made ponds or lakes, the mollusc fauna of bodies of water some distance away has been seen to appear very soon, probably being brought in on the feet of various water birds.

With reference to variations after maturity in parasitic worms, Dr. Cort noted that schistosomes may begin egg-laying, indicating maturity, and subsequently grow three or four times as large. He also raised the question as to whether a parasitic species does vary considerably with different host species. Dr. Ransom sustained the contention that a worm species does vary with the host species, pointing out that *Syngamus trachealis* attains a length of 20 to 25 mm. in the chicken and 40 to 45 mm. in turkeys.

Dr. Bartsch reported on a number of molluscs obtained from dealers in aquarium supplies sent him by Dr. Stiles for determination with reference to the possibility of the introduction of fluke diseases through the importation of snails for use in aquariums. Two of the forms examined are Japanese, *Planorbis* and *Vivipara*, a third species being an *Ampullaria*, evidently American, as it has a horny operculum, the operculum in Asiatic species being calcareous.

Dr. Bartsch also noted as of interest to helminthologists in view of the historical association of shipworms with the subject of helminthology, that shipworms on the West coast of the United States have cost the United States navy at least \$25,000,000. A matter of interest is that no European species have become established in the United States so far as known, probably because the era of wooden ships ended before these worms could become established and also because of essential differences in environment. Species are sharply restricted in distribution by their requirements in respect to fresh, brackish or salt water.

Dr. Ransom presented a preliminary report by Dr. Ransom and Miss Cram on the course of migration of ascarid larvae in the body. Stewart suggested that the larvae probably went by way of the portal system to the liver and thence by the hepatic veins and vena cava to the heart and pulmonary arteries to the lungs, but possibly by way of the gall duct to the liver and thence to the heart and lungs. Ransom and Foster regarded the route by way of the liver as the probable one. Yoshida reported that larvae went to the abdominal cavity and thence to the lungs and elsewhere by penetration of tissue, migration by way of the blood vessels being considered of minor importance. Ransom and Cram are unable to confirm Yoshida's findings. They find the larvae in large numbers in the circulatory system, including the portal vein, vena cava and right side of the heart. In sections of the liver from animals infected the day before, the larvae are often found in the blood vessels but never in the biliary canals. In less than twenty-four hours they have been found in the superficial lymph nodes, including the submental nodes. In three they have been found in the inguinal, axillary and deep cervical lymph nodes and in fact during the first week they have been found in practically all the lymphatic nodes. Within twenty-four hours they can be found in the mesenteric lymph nodes in large numbers, especially in the ileocolic nodes. It appears from these findings that the blood and lymph streams constitute the important paths of migration.

Dr. Cort called attention to the fact that Tanabe has reported *Echinostoma perfoliatum* var. *japonicum* from man. Encysted stages of this worm were first discovered in fresh water fish and fed to dogs, producing the adult worms. Subsequently echinostome eggs were found in human feces, and it was surmised that these came from worms of the same species. To settle this point, Tanabe ate some of the encysted forms from fish and developed in himself worms giving rise to eggs apparently identical with those found in feces in the first instance.

Dr. Cort also presented a summary of our knowledge in regard to the course taken by the larvae of *Schistosoma japonicum* from their entrance by way of the skin to their final destination in the blood vessels. This point has been contested at some length by Japanese workers. Miyagawa has examined

dogs to ascertain the course of the larvae and concludes that the larvae go by way of the venous or lymphatic systems to the heart and lungs, thence to the arteries of the liver and intestine, and thence to the portal system, passing two sets of capillaries. Narabayashi infected young mice and sectioned them *in toto* and concludes that the worms go to the heart by way of the venous system and, in smaller numbers, by way of the lymphatic system, some of them dying in the lymph nodes; from the heart they go to the lungs, and from here they proceed in small numbers along the path indicated by Miyagawa, but much the larger number of larvae pass from the lungs to the pleural cavity and mediastinum, migrate through the loose connective tissues to the liver and thence into the portal system. Narabayashi's conclusions are confirmed by another Japanese worker. The schistosome is a blood voyager and grows but little until it reaches the liver, whereas *Paragonimus* is a tissue and cavity migrator, traveling slowly and growing rapidly as it migrates, and apparently maturing about the time it reaches the lungs.

Dr. Tubangui noted that an *Echinochasmus* is present in the dog in China.

Mr. Chapin exhibited a specimen of a tapeworm from the whale, *Balaenoptera musculus*. This worm has a very odd unarmed scolex. The scolex in the unattached worm is cylindrical, but after insertion in the intestinal mucosa the scolex becomes spherical, thereby attaching the worm to the mucosa by a riveting action.

Dr. Stiles presented the following note:

A THIRD CASE OF GONGYLONEMA FROM MAN

Up to the present time, two cases of *Gongylonema* in man have been reported. The first case was reported by Ward, the worm occurring in the lower lip of a girl in Arkansas. Ward suggested that the worm might be *G. pulchrum*. The second case was reported by Stiles, the worm occurring in the lower lip of a girl in Florida. The present case, the third, involves the occurrence of the worm in the mouth of a girl in Georgia. The worm in this case is badly macerated, but a part of the cuticle is intact near the head and this shows the presence of two of the characteristic bosses. The specimen is a female, 35 mm. long and with the uterus post-equatorial. Almost all of the anterior cuticle is lost by maceration. In the first two cases recorded, the presence of the worm was accompanied by pronounced irritability on the part of the patients. This finding, in connection with the previous records, raises the question as to whether it is a parasite of some animal other than man which is accidentally present at times as a parasite of man, or whether it is a parasite of man now being found but previously overlooked. For the purpose of scientific record it is better to keep a doubtful species distinct, even though it is later necessary to suppress a name as a synonym than to take the chance of confusing two things under one name, with the more serious difficulty of disentangling biological facts. For the *Gongylonema* from man the name *Gongylonema hominis*, species inquirerenda, was proposed with Ward's specimen as type material.

Dr. Stiles also reported that in experiments on gas house tar it had been found that the tar could be set on fire by the use of paper and that precautions were being taken, in connection with the use of this substance to prevent fly breeding in feces, to safeguard against fire in its use.

Dr. Hall presented the following notes:

A NEMATODE WITH SIX UTERI

A nematode collected from the mesenteries of the puff adder, *Bitis arietans*, by Dr. H. H. Curson of Grahamstown, South Africa, was found to have six uteri. On comparison with the descriptions in a recent paper by Baylis, this material appears to be *Polydelphis quadricornis*. Baylis lists a total of four species of *Polydelphis* as having six uteri, which is the maximum known among the nematodes.

FILARIA NYCTICEBI MOENNIG, 1920

A parasite recently described from *Nycticebus tardigradus* in the Centralblatt Bakt., Parasitenkunde, etc., is evidently a Rictularia, as the description and figures clearly show. To avoid confusion in the consideration of species of *Filaria* and of Rictularia, the species is here transferred to Rictularia as *R. nycticebi* (Moennig, 1920).

GID IN SHEEP IN COLORADO

Under date of January 13, 1921, Dr. W. E. Howe reports the occurrence of gid in sheep at Calhan, Colo., a coenurus from the brain of one animal being sent in to the Bureau of Animal Industry at Washington, D. C. This disease has been reported previously from Colorado by Newsom and has twice been diagnosed as present in that state on somewhat uncertain symptoms by the veterinary editor of the Sheep Breeder's Gazette. The history of these cases indicates that the infection originated in Montana, where gid has been enzootic for over thirty years.

STEPHANURUS DENTATUS AS A PARASITE OF CATTLE

Two worms collected from the small bile ducts of a bovine (whether steer, cow, calf or bull not stated) by Dr. T. B. Pote at an abattoir in St. Louis, Mo., were sent in to the Zoological Division of the Bureau of Animal Industry by Dr. J. J. Brougham on January 15, 1921, with a report to the effect that they appeared to be the common kidney worm of swine. This identification was confirmed. The worms were both males of *Stephanurus dentatus*. This parasite has heretofore been reported only from swine. The life history according to Bernard and Bauche is as follows: The eggs from female worms in the perirenal fat enter the ureters through fistulous tracts as a rule and pass to the exterior in the urine. The young worms hatch and develop to the infective stage. In this stage they may enter the host animal by way of the skin or the mouth. In the first case, evidently the normal mode of infection, the worms develop in the vicinity of the kidneys. In the second case the worms develop in the liver, as a rule, though they have been found in various other organs. Apparently therefore the infection, in the case of the animal reported here, took place by way of the mouth.

The fiftieth meeting of the society was held February 26, 1921.

Mr. Ackert presented the following note:

THE LONGEVITY OF FOWL TAPEWORMS

It is known that when certain cold-blooded vertebrates are kept in confinement they quickly lose their cestodes. Opportunity to ascertain whether this phenomenon occurs in certain warm-blooded vertebrates was afforded during the last two years in connection with studies on the life histories of chicken cestodes. The chickens under observations were hatched on farms near Manhattan, Kan., and had free range of the premises. When slightly over four months of age, they were passing cestode proglottids. At this time they were placed in a small third-story room and given food free from animal tissues except an occasional feeding of fresh beef. In midwinter they were transferred to an equally small screened pen with cement floor.

The subsequent intestinal examinations yielded the following results: Chick 324 retained a heavy infestation with *Davainea cesticillus* for four months. Chick 287 showed a heavy infestation with *D. tetragona* and *D. echinobothrida* after five months. Chick 286 had an infestation with forty-eight *D. tetragona* and *D. echinobothrida*, and two *D. cesticillus* after six months. Chicks 287 and 268 had lost all of their tapeworms in eight months. Chick 269 retained 318 tapeworms for eight months, the species represented being *D. tetragona*, *D. echinobothrida* and *D. cesticillus*. Chick 315 had thirty-eight *D. cesticillus*

and one *D. tetragona* after thirteen and a half months. Chick 284 had lost all of its cestodes in fourteen months. Chick 283 had six *D. echinobothrida* and Chick 285 two *D. echinobothrida* after fourteen and a half months.

In summarizing it is seen that of ten infested chickens placed in close confinement, three lost their cestodes in from eight to fourteen months, and seven retained tapeworms during periods ranging from four to fourteen and a half months. The species of cestodes retained included *D. cesticillus*, *D. tetragona* and *D. echinobothrida*.

In comment, Dr. Hall noted that an amphistome had recently been reported from a zebra in the London Zoological Gardens under circumstances indicating that worms of the species in question might live at least eight years.

Dr. Cobb raised the question as to the exact action of the hooks on tapeworm heads. In reply, Dr. Stiles stated that these hooks may be observed to work together in a coordinated fashion or in an irregular and incoordinated fashion, each hook apparently acting individually.

Dr. Cobb exhibited some pieces of apparatus for examining specimens in liquids, the apparatus being designed to orient the specimens, especially nematode worms, for observation from different points. Mounted stage forceps were attached to different types of tanks in such a way as to permit of rotating the object in all planes.

Dr. Tubangui presented an abstract of a paper describing a new fluke, a species of *Prohemistomum*, from the dog in China. This fluke is 1.5 to 2 mm. long by about 1 mm. wide. The genitalia are similar to *Pr. appendiculatum*, but there is no distinct attaching disk.

Dr. Tubangui also gave a discussion, illustrated by figures, in regard to the genus *Opisthorchis* and related genera. Blanchard listed over twenty species of *Opisthorchis*. Looss made the genera *Metorchis* and *Holometra* and associated them with *Opisthorchis* in the subfamily *Opisthorchiinae*. Later the genera *Clonorchis*, *Amphimerus* and *Paropisthorchis* were established. *Clonorchis* was based on the branching testes, *Amphimerus* on the separation of the vitellaria into anterior and posterior portions, and *Paropisthorchis* on the presence of an acetabulum borne on a papilla. Notaulus was based on the presence of testes filling the entire width of the posterior body. Lühe created the subfamily *Clonorchinae* for forms with a dorsal excretory pore. All of these genera, except *Opisthorchis*, are open to criticism. The species left in this genera may be divided into two groups. One group, represented by *O. simulans*, has follicular, much-lobed ovaries, the vitellaria extending from the middle of the body to the ovaries. The other group, represented by *O. felineus*, has smoother lobed ovaries and the vitellaria are posterior to the acetabulum or ovary. But intermediate forms, as regards these features, are found. Species of *Amphimerus* may have an acetabulum borne on a papilla, as in *Paropisthorchis*. *O. obsequens* has branched testes and might be considered either an *Opisthorchis* or a *Clonorchis*. Similar objections may be raised to the feature forming the chief character of the genus *Amphimerus*.

Dr. Stiles suggested the possibility of determining variation within a species by mass infection from a single parent parasite.

Dr. Barlow noted that there was considerable difference between specimens of *Fasciolopsis buski* collected from a 9-year-old child and those from a man. Egg production may begin in a specimen 8 to 9 mm. long from a child, while in specimens of the same size collected from adults no uterine structure is visible.

Dr. Bartsch noted that mass studies on snails had shown no variation in species he had thus investigated, the species appearing as if cut in a die, whereas other species are very variable. Species transplanted from the Bahamas could not be crossed on very similar species in Florida under very similar environments, whereas the Bahama species could be crossed on other species in the Bahamas apparently quite dissimilar and unrelated.

Dr. Cort stated that the variations in Fasciolopsis could be largely explained by differences in technique, most of the variations being those of size and shape.

Dr. Barlow noted that these changes were produced by the live fluke in movement and by the effect of fixing fluids, the changes produced by movement while alive not being present in preserved specimens. The fluke with spines anteriorly but not posteriorly is produced by the administration of B-naphthol as an anthelmintic, the posterior part being killed and deprived of its spines.

Dr. Cobb noted that different effects are produced in the appearance of worms by killing with heat and by killing through effects on the nervous system or otherwise.

Dr. Hall noted that worms obtained by anthelmintics were subject to the destructive action of the anthelmintic, carbon tetrachloride being especially destructive to hookworms, and were also subject to the digestive and macerative effects of the intestinal contents. Worms which pass out after long intervals, as in the case of stomach worms of sheep when removed by copper sulphate or ascarids of horses when removed by the use of carbon bisulphide, are usually very much distorted and macerated and often fragmented.

Dr. Barlow noted that B-naphthol frequently produces holes, having the appearance of being punched out, in specimens of Fasciolopsis.

Dr. Stiles noted that if man were studied and described on the basis of variations accepted as satisfactory in the case of flukes, the human group could be separated into a large number of species, if not of genera.

Mr. Chapin reported the findings in a postmortem examination of an African wolf, *Lycaon pictus*. Headless chains of *Taenia pisiformis* were found in the stomach. Fifty specimens of *T. pisiformis*, twelve heads and twenty gravid segments of a worm very similar to the adult *Echinococcus granulosus*, and one *Toxascaris*, apparently *T. limbata*, were found in the small intestine. The *Echinococcus* does not appear to be the common species, *E. granulosus*. It is larger and has a head and five segments. Two complete worms were found to measure each 5.04 mm. in length. Lindenfeld has reported a form from the dingo which is 10 to 30 mm. long, and Johnston has noted that this is either a new species or represents the young strobilla of a species other than *E. granulosus*. The hooks of the species from the wolf differ in size and shape from those of *E. granulosus*. A comparison was also made with *Taenia oligarhira*.

Dr. Stiles reported two new cases of *Diphyllbothrium latum*, one from Florida and one from Connecticut. No history of the cases known.

Dr. Stiles also noted that the use of sawdust for admixture with night soil had been legally recognized in some community in its ordinances, this recognition antedating the development of the use of this substance in his investigations. In comment, Dr. Barlow stated that sawdust had been used in China for centuries for mixing with night soil.

Dr. Barlow presented a very interesting note on what he terms fasciolopsiniasis, noting its occurrence in China with special reference to Che-Kiang province and defining it in part as a subacute or chronic disease associated with the presence of Fasciolopsis and resulting in asthenia and death, probably as a result of intoxication. The fluke is the largest of the human flukes and may be 104 mm. long by 18 mm. wide. The flukes may occur from the stomach to the colon, and are sometimes vomited. They attach to the mucosa and patients complain that they can feel the movement of these parasites. Oil of turpentine is used by the natives as an anthelmintic to remove them. B-naphthol has proved the most satisfactory remedy, used in doses of 60 to 75 grains, divided into three portions. There is a marked pallor in this disease, but apparently no true anemia. There are two types of the disease, one with and one without edema. Diarrhea and indigestion are prominent symptoms. There are about one and one-half million cases in the endemic area. Whole families are sometimes wiped out by the disease. The prophylaxis is apparently too general to impress the natives. One native treatment consists in burning the skin with punk. Numerous statistics were given showing how very severe the infesta-

tion may be and how serious this disease is. The talk concluded with the exhibition of photographs and specimens, one of the exhibits being an artificial tapeworm made by stringing these flukes end to end on a thread to form a string 100 feet long, the flukes in this chain being passed by one patient after a single treatment.

Dr. Hall presented the following note:

CODIOSTOMUM STRUTHIONIS FROM STRUTHIO CAMELUS

Under the name *Sclerostomum struthionis*, Horst in 1885 described a worm belonging in the Strongylidae from the ceca of *Struthio molybdophanes*, the ostrich of Northern Africa. This worm was placed by Railliet and Henry in 1911 in the new genus *Codiotomum* as the type species, and is as yet the only species of the genus. Recently specimens of this worm were forwarded for identification to the Zoological Division of the United States Bureau of Animal Industry by Dr. H. H. Curson of Grahamstown, South Africa, with a label to the effect that they were collected from the stomach of *Struthio camelus*, the ostrich of South Africa. This worm can not be confused with *Strongylus douglasi* Cobbold, 1882, emend. Geddoelst, 1911, which has been referred to the genus *Trichostrongylus* by Theiler and Robertson in 1915. *Trichostrongylus douglasi* is a very small form with the small trichostrongyle head, without buccal capsule; *Cod. struthionis* is a much larger form with a well developed buccal capsule and corona radiata.

MAURICE C. HALL, Secretary.